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## FURTHER CONSIDERATION OF THE OCCURRENCE OF HUMAN REMAINS IN THE PLEISTOCENE DEPOSITS AT VERO, FLORIDA

BY OLIVER P. HAY

IT is here taken for granted that anybody who is sufficiently interested to read this article has either already studied the papers written on the subject by Sellards, MacCurdy, Vaughan, Hrdlička, R. T. Chamberlin, and Hay, or that he will proceed to do so. This course will obviate the necessity of re-describing the topographical, geological, and paleontological situation at Vero.

After a study of the problems presented at Vero, the authors just named each expressed his independently formed opinion in a symposium which appeared in the January (1917) number of the *Journal of Geology*. Since that time Doctors Sellards and MacCurdy have contributed interesting articles on the subject<sup>1</sup> and the writer has published a condensed statement of his views.<sup>2</sup> It is to be regretted that Dr. Hrdlička has not, up to the time of writing these lines, been able to present his projected detailed report<sup>3</sup> in which were to be discussed the broader anthropological and archaeological problems concerned in the matter.

At any rate, it seems to the writer that progress is being made;

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<sup>1</sup> *American Anthropologist* (N. S.), vol. 19 (1917), pp. 239-261.

<sup>2</sup> *Journal Washington Academy of Sciences*, vol. VII, pp. 358-360.

<sup>3</sup> *Symposium*, p. 50.

that some questions are already settled and others well on the way. The writers are agreed that there are presented at Vero three distinct geological deposits of Quaternary age; that in all of these there are found remains of animals which have hitherto been regarded as belonging exclusively to the Pleistocene; that human bones and artifacts occur in the middle and the uppermost of the three strata in some sort of association with remains of these Pleistocene vertebrates, and that the human bones and the artifacts differ little, if at all, from those of pre-Columbian Indians.

It appears further that the following questions are still matters of contention:

1. Are the vertebrate fossils found in deposits no. 2 and no. 3 there by primary inclusion, or have they been washed in from older deposits?
2. Were the human bones introduced into the two deposits by artificial burial or did they reach their recent positions by natural means?
3. Have any of the human remains found in no. 2, the age of the deposit itself?
4. What is the geologic age of stratum no. 2?
5. What is the geologic age of stratum no. 3?

1. Dr. R. T. Chamberlin<sup>1</sup> has taken the position that the vertebrate fossils in no. 2 and no. 3 have been washed in from older beds and within comparatively recent times. Not far back from the valley where these deposits occur, he found a stratum from 2 to 4 feet thick consisting of a "dark-brown to true-black, firmly indurated sand, or sandstone, cemented by ferric hydroxide and organic matter." Above this there is a soft, spongy, peaty layer, the remains of an ancient bog, which varies in thickness from nothing to 6 inches. These old bog materials are covered up by wind-blown sands to a depth ranging from 7 feet on the eastern border to hardly 2 feet one mile further west. Chamberlin has expressed the opinion that it is this "Pleistocene bog accumulation and its associated deposits which originally housed the old mammalian bones."

It seems to the writer that Sellards's last paper<sup>2</sup> disposes of this theory. The main canal and its two laterals gash in three

<sup>1</sup> *Symposium*, p. 36.

<sup>2</sup> *American Anthropologist*, vol. 19, pp. 239-251.

different directions the deposits noted by Chamberlin; and the banks and dumps of these canals and of the old drainage channels have been thoroughly searched and no fossils have been found in that old bog. This absence of fossils is remarkable because some bones and teeth might well have been expected to occur there. In connection with this dearth of bones in the bog, must be taken into consideration the fact that only those fossils, if any had been present, which had been eroded out of the bog materials along the banks of those little rivulets could have been swept down into the deposits of no. 2 and no. 3; for the remainder of the area has always been protected by the stratum of wind-borne sands.

Chamberlin has found in the deposits just mentioned what he regards as portions of the indurated sandstone of the old bog which have been carried down by the streams and so rolled and eroded that some of them are now designated as "cannon-balls." Now, if those vertebrate fossils had originally been buried in the peat of the bog they would have been at the best rather soft and brittle. What chance then would they have had for arrival at their destination in any recognizable condition when blocks of indurated sandstone were rolled into "cannon-balls"? If the bones had been buried in the indurated sandstone they would have been penetrated by the indurating materials, which is not the case; and some of them would now be found with portions of the hard sandstone adhering to them, which also is not the case. Most of the bones are broken and have suffered some decay, and some have been eroded; but most of them show no erosion whatever. It would, too, be just as reasonable to insist that the human bones had been washed down out of the bog as that this had happened to the bones of the animals.

Attention has been called by Sellards to a number of cases in which several bones of one individual were associated. It is perfectly obvious that, if even a complete skeleton of an animal had been buried in a deposit, had there lost its ligaments and the animal matter, and had become partly fossilized, and then disturbed and transported, we may say even a quarter of a mile, the chances would be almost infinitely small that any two bones would find

lodgment near each other. Yet of the wolf (*Canis ayersi*), thirty or more bones were found at one place; and near by was the skull and femur of probably the same individual. Many bones of *Chlamytherium*, apparently belonging to one individual, were found at one place. Several bones of the jabiru (*Jabiru weillsi*), probably of one bird, were found close together. A jaw and large parts of the tusk of a mastodon were found in close proximity. Let us imagine a partially fossilized tusk of a mastodon or a delicate skull of a tapir being rolled a quarter of a mile down stream intact, while blocks of indurated sandstone are being ground down into globes. Thin turtle shells, softened by decay of the animal matter, could hardly endure transportation without destruction.

The cases just mentioned concern more especially materials found in no. 2. The writer has mentioned the fact that seven bones of an extinct snapping turtle (*Chelydra sculpta*) had been found together in no. 3. An illustration of these will be published in the forthcoming report of the Florida Geological Survey. Recently the writer has studied some deer bones found in no. 3. At one of the stations on the south bank of the canal and extending along it about 15 feet, were collected fifty deer bones; and while many of these are broken and some are injured by decay, none show signs of wear by water and sand. In this lot there are at least three individuals; but who can suppose that, if a skeleton of a deer had been buried in the bog already referred to, and had then been washed out, probably little by little, and swept down stream, any two bones would have been landed within fifteen feet of each other? The fifty bones of the collection would have represented as many individuals. Among these bones is a part of a left maxilla with three molars which fit accurately against the molars of a lower jaw. A second and a third dorsal vertebra seem certainly to have belonged to one deer. Three lumbers, the third, fourth and fifth, fit nicely together. A sacrum is complete and both innominate are present and join it accurately. Two radii belonged certainly to one young deer. One individual of the lot, probably all of them, belonged to an extinct species, *Odocoileus sellardsiæ*.

Chamberlin<sup>1</sup> in referring to similar cases, suggests that such

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<sup>1</sup> *Symposium*, p. 39.

remains may have been buried along the banks in the upland deposit and, on being undermined, have fallen down and been reburied without suffering transportation. Unfortunately for this explanation, fossil skeletons do not appear to be any more abundant in that upland deposit, along the Van Valkenberg valley than they are in the old bog further up the tributary streams.

The writer believes that the theory of the secondary deposit of the fossil bones and teeth in the strata no. 2 and no. 3 is untenable and that we shall hear little more of it.

2. Let us now consider briefly the question whether or not the human bones had been introduced into the deposits no. 2 and no. 3 by burial at human hands. The writer believes that he is correct in saying that only Dr. Hrdlička has expressed an opinion to that effect. It is evident that Dr. MacCurdy does not share this opinion; for in his article in the *American Anthropologist*, on page 258, he indicates his belief that we can be sure that the oldest human skeleton and cultural remains at Vero are as old as the base of the upper deposit. It is the opinion of the writer that Dr. Sellards, in his last paper, has put the question of intentional burial of those human bones out of dispute.

It is not for us to assign limits to the wisdom of God, nor to the cunning devices of nature in the accomplishment of her ends, nor to the foolishness of men; but we do nevertheless seek for some gleams of reason in what human beings do. Can anyone now explain why savages who make pottery and flint implements and bury their dead would dig a grave in a water-soaked bed of muck, where masses of leaves and sticks and stems and even logs were likely to be encountered; when, by going a few rods away, they could make the grave in loose dry sand? And, if the burial be granted, how did it come about that the bones of the skeleton, even the elements of the skull, became scattered so widely? Why, too, did they in their migrations so generally seek the parting plane between the two strata? A sufficient explanation of what is found in the case of the human remains called no. II is that a skeleton or a part of one, probably in a more or less scattered condition, had been covered up in stratum no. 2, when this was being deposited,

not far above where the bones were recently found. After the bones had lain there long enough to become rotten, possibly somewhat fossilized, a freshet unearthed them and scattered some of them, including the thoroughly macerated and easily disarticulated skull, over the sloping surface of the bed of the stream. Apparently at once a lot of vegetable debris was thrown down on them, thus fixing their position. The writer believes that the theory of intentional burial of the bones in either no. 2 or no. 3 can not be defended.

3. Do any of the human remains which are found in no. 2 have the age of the deposit itself? The writer believes that the human bones are themselves as old as are the deposits in which they are found. This is the opinion of Dr. Sellards. Dr. Chamberlin says:<sup>1</sup>

While this deposition of no. 2 was in progress the human bones are believed to have received their first and only burial in connection with the stream deposit.

Dr. MacCurdy, as already quoted, believes that all that we can be sure of is that the human remains date back to the interval separating the middle (no. 2) from the upper (no. 3) deposit.

It is believed by the writer that the bones found in no. 2 were covered in when the bed was being deposited because:

- a. They have been found in that stratum in two different cases.
- b. They are in practically the same state of fossilization as are the bones of the animals.
- c. Not the slightest evidence has been produced to show that they were put there by human hands.

The circumstances connected with skeleton no. 11 have been discussed by Sellards, Hrdlička, MacCurdy and just now by the writer. MacCurdy in his last paper (p. 258) thought that Sellards in his paper of the same date had ignored this skeleton no. 1; but that is not wholly correct. While Sellards did not discuss this skeleton, he did refer (p. 248) to what he had already written about it. As to this skeleton nobody denies that the bones were found where reported. Nobody has attempted to show that there was any disturbance of the sand and marl above the bones; although the block of marl rock which capped the supposed grave was yet

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<sup>1</sup> *Symposium*, p. 37.

there when the geologists and anthropologists visited the place. If, however, the anthropologist<sup>1</sup> believes that muck and sand, disturbed in digging and refilling a grave, will in time rearrange themselves so that the distinction between the two would be impossible, he would see little use in searching for a disturbance. Nobody has tried to explain in what way most of both legs and a little of both arms of that supposedly interred body might have been preserved and all the rest of the skeleton have disappeared. Had the skull, the vertebrae, the scapulae, and the pelvis been buried with the arms and legs, it is probable that some of them, or parts of them, would have been found either in the sand bed or lying loose at its base.

4. What is the geologic age of stratum no. 2? Before an answer is given to this question it will be necessary to discuss somewhat the geology and paleontology of the Pleistocene of North America.

It is now generally recognized by geologists that there were during the course of Pleistocene times four or five glacial and, corresponding to these, three or four interglacial, stages. These stages are presented in the following table, the names of the interglacial stages being italicized. A postglacial stage has been called by the writer the Wabash.<sup>2</sup>

10. *Wabash*.
9. Wisconsin.
8. *Peorian*.
7. Iowan.
6. *Sangamon*.
5. Illinoian.
4. *Yarmouth*.
3. Kansan.
2. *Aftonian*.
1. Nebraskan.

During the various glacial stages widespread deposits of till, with intermingled sands and gravel and boulders of northern origin, were laid down over portions of the Northern States. The accompanying map (fig. 1), the publication of which is permitted by the

<sup>1</sup> *Symposium*, p. 48.

<sup>2</sup> *Smithsonian Miscellaneous Collections*, vol., LIX no. 20.



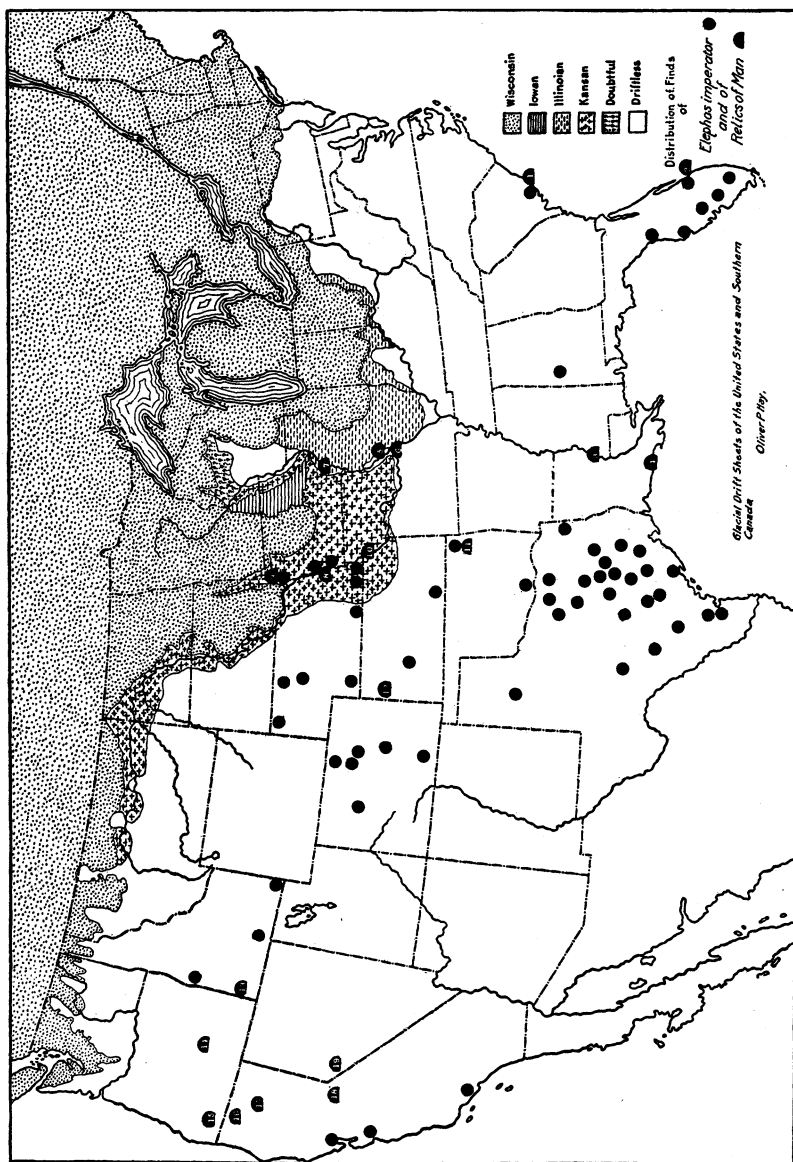


FIG. I

Carnegie Institution of Washington, shows the general distribution of each of these glacial drift sheets, except the Nebraskan. This is hidden by later deposits, except where the latter are cut through by rivers. The interglacial stages are represented here and there in the region by deposits of various kinds, river gravels, sands, old soils, and beds of loess. All of these sometimes bear fossils and thus give us glimpses of the life of the times.

The most important of the fossil-bearing deposits found intercalated between deposits of glacial drift are the Aftonian gravels and sands of western Iowa. The Missouri river in this region has cut down through the Kansan drift so as to expose the Aftonian and Nebraskan beds. From this Aftonian, the earliest interglacial Pleistocene, there has been collected an important assemblage of fossil vertebrates. A list of the species has been published by the writer.<sup>1</sup> It includes three species of mastodons, three species of elephants, four or five species of extinct horses, a hipparion, an extinct bison, at least two undetermined species of camels, the Canadian beaver, the giant beaver, peccaries, mylodon, and megalonyx. In what have been known as the Equus, or more properly the Sheridan, beds in western Nebraska and Kansas an identical fauna has long been known. In the publication just cited and on the same page the writer has published a list taken from Dr. W. D. Matthew, of the species found at the type locality of the Sheridan beds, near Grayson, some miles from Hay Springs, Nebraska. To this list are to be added two horses and *Elephas imperator*.

There can be no doubt that the Aftonian interglacial deposits are simply a continuation eastward of the so-called Equus, or Sheridan, beds.

If, now, we study the collections made in the drift-covered regions east of the valley of the Missouri river, we must recognize that the mammalian fauna had at the time of its existence here undergone some changes. In northern Missouri and in southern and eastern Iowa there are large tracts which are covered by Kansan till or by this overlain by loess of different ages. In

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<sup>1</sup> *Iowa Geological Survey*, vol. XXIII, p. 26.

Illinois, Indiana and Ohio, there are extensive regions which are covered up by Illinoian drift or by more recent interglacial deposits. Many of the animals which are found in the Aftonian and Sheridan deposits are found on or in some of the younger deposits just mentioned, such as *Elephas columbi*, *E. primigenius*, *Mammut americanum*, several species of *Bison*, *Tapirus*, *Cervalces*, *Mylodon*, *Megalonyx*, *Castoroides* and *Equus complicatus*; but no *Elephas imperator* has been found, no species of *Hipparion*, none of the many Sheridan and Aftonian horses except *E. complicatus*; no saber-toothed tigers and no camels. The region and the climate must have been favorable for their existence; and they would have left some traces of themselves if they had existed. From our present knowledge we can only conclude that they had perished.

When we come to examine the rather extensive collections which have been made in the deposits of the old filled-up lakes which lie upon the last drift sheet, the Wisconsin, we find that the vertebrate fauna had suffered further extensive changes. There are yet the two elephants and the mastodon, peccaries, the existing moose (*Alces*) and the extinct moose (*Cervalces*), also *Castoroides*, *Megalonyx*, and short-horned bisons; but there are no longer found any of the long-horned bisons of former times, no tapirs, no mylodons, and of course, none of the species which had dropped out of existence shortly after the first interglacial stage. It cannot be affirmed that the climate of our northern states did not permit the presence there of the missing species; for there was a period after the passing away of the Wisconsin ice sheet when peccaries lived along the shore of Lake Erie and in Michigan; and the megalonyx penetrated as far north as Minneapolis. What had taken place is what might have been expected; namely, that as Pleistocene times passed on one species after another dropped out of existence, while its place was either taken by other species or probably in most cases left vacant.

It may be well to take into consideration here the percentage of extinct species which are found at some of the places where considerable collections have been made. Of the species found in the Aftonian of Iowa about 90 per cent. are extinct; but as the deposits

are usually coarse, showing rapid currents, few of the smaller animals, such as rodents and insectivores, have been collected. Only the larger mammals are represented. The type locality of the Sheridan beds, at Grayson, Nebraska, has furnished about 71 per cent. of extinct forms. The cave at Port Kennedy, Pennsylvania, whose deposits are assuredly of early Pleistocene age, presents a fauna of which 80 per cent. of the species are no longer living. The conditions there were apparently favorable for the preservation of all kinds of land vertebrates; and the percentage may be taken as representing in a general way the composition of the early Pleistocene vertebrate fauna, as regards species yet living and those which have become extinct.

In a fissure in northwestern Arkansas, Barnum Brown secured an important collection of vertebrates. Of the mammals about 47 per cent. belong to extinct forms. On account of this low percentage, the absence of various species, and the presence of some forms of aboreal type, the writer concludes that the collection represents the Illinoian stage; but inasmuch as many low and small forms not so likely to be distinct from living species are present and many extinct species are missing which certainly were then living, it seems not impossible that the percentage is too low to represent the actual fauna. Naturally, after the Wisconsin stage had passed, relatively fewer extinct species appear and finally the fauna passes into that of the Recent epoch.

At this point reference may be made to the discussion which went on about the time (1890) when G. K. Gilbert published his monograph on Lake Bonneville. Cope and Marsh at that time held that the so-called *Equus* fauna and the deposits which contained it belonged to the Pliocene.<sup>1</sup> Gilbert, basing his views especially on the physical evidences, came to the conclusion that the fossil-bearing deposits around Lake Lahontan, Lake Bonneville, and Fossil Lake, Oregon (the latter furnishing what Gilbert accepted as a typical *Equus* fauna), belonged to the Pleistocene. This view has been accepted by vertebrate paleontologists in general. Gilbert, however, went further. Holding then that there had been

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<sup>1</sup> Gilbert, *op. cit.*, pp. 397-400.

only two glacial stages and finding that the old lake deposits which furnished the *Equus* fauna belonged near the close of the later stage, he assigned the beds to the late Pleistocene. In this the writer believes that Gilbert was wrong. The fauna of Fossil Lake is identical with that found near Hay Springs, in the Sheridan beds. These beds, followed north, were found by W. B. Scott to pass beneath a drift sheet, which can be only the Kansan; while toward the east they pass likewise beneath the Kansan and reveal the same fauna in the valley of the Missouri river. Essential elements of it never reappear in deposits overlying the Kansan and later drift sheets. Between Gilbert and the paleontologists mentioned the honors were about equally divided.

Returning to the region of the Great Plains and making our way into Oklahoma and Texas, we meet everywhere with the Aftonian, or Sheridan, fauna. *Elephas imperator* (fig. 1), camels, several species of horses, some diminutive, others gigantic, tapirs and long-horned bisons, are found or likely to be found anywhere, even down to the border of the Gulf. Toward the east, camel remains have been found on Brazos river in Austin county, Texas; and a part of a skeleton of *Elephas imperator* was found by Dr. T. Wayland Vaughan close to the line between Texas and Louisiana. In some places this Pleistocene fauna is associated with remains of a species of mastodon belonging to *Gomphotherium*, a genus which was abundantly represented during the Pliocene. The genera *Mylodon* and *Megalonyx*, those old invaders from South America, have their ranks strengthened by the presence of *Megatherium*, *Nothrotherium*, and *Glyptodon*. It is surprising in studying the Pleistocene vertebrates of Texas how seldom remains of yet living species are met with.

In the low region along the lower portion of the Mississippi river from Louisiana to Alabama there have been found up to this time no *Elephas imperator*, no camels, no glyptodons, and only two species of horses. The fauna so far secured is approximately that of the post-Illinoian. The only exception to this is the association of *Equus leidy* with *E. complicatus* in deposits at Natchez. Here too, is found a saber-toothed tiger, a species of which occurred

also in the Arkansan fissure already mentioned. Inasmuch as the muskox *Symbolos cavifrons* has been reported from the same place it may be that the age of the deposits is Illinoian.

When we enter Florida the fauna which has been described as occupying the Aftonian beds (the so-called *Equus* beds of the Great Plains) and the coastal plain of Texas, reappears in full strength, but with slight modifications. There are present of the *Xenarthra*, *Megatherium*, *Mylodon*, *Megalonix* and *Glyptodon*. *Chlamytherium* replaces *Nothrotherium*; and *Dasyfus* is present. Of horses there are three distinct species, a large one, a medium-sized one, and a small one. Tapirs are represented by probably two or three species. Peccaries, hitherto unknown in the Gulf States, come to light at Vero. Camels are not abundant in the state, but are there. The genus *Bison* appears to have been represented by *B. latifrons*, the one with the longest horns, and probably by other species. Besides the common mastodon and the Columbian elephant, *Elephas imperator* has been found in several places. Great wolves and coyotes and foxes of extinct species are recognized. In addition to these there are many smaller creatures, some now extinct, many yet existing. There were many tortoises mostly belonging to extinct species and some of them were of immense size.

No one, it seems to the writer, can doubt that the fauna which has been described lived in the region west of the Mississippi in early Pleistocene times. There appears to be no good reason to doubt that it lived in Florida at the same time. Did it, now, continue to live there until quite recent times? Our friends the anthropologists appear to be willing to believe this. The writer holds that the view is wholly wrong.

a. It is improbable that a fauna composed as this was of, first, a native element, of another which had reached the country by way of the cooler regions of Asia, and of a third which had made an irruption from various parts of South America, a mixed assemblage of contending elements, subjected to the extreme climates of glacial and interglacial epochs and repeatedly to the pressure of tribes forced down from the north during glacial times, that such a fauna

would continue practically unchanged up into the Recent period and then suffer sudden extinction.

b. If species of *Megatherium*, *Myiodon*, *Chlamytherium*, *Glyptodon*, three species of horses, two or more species of tapirs, camels, species of long-horned bisons, *Elephas imperator*, and saber-toothed tigers lived in Florida after the close of the Wisconsin glacial stage, why did not some of these extend their range north as far as the northern half of Ohio, Indiana, and Illinois? Nearly all of them had at one time lived as far north as those states, and evidently the climate invited them; and the Wisconsin drift would not have burned their feet so soon after the ice had left it.

c. Why also did not these animals occupy even the lower part of the valley of the Mississippi? Along this river throughout Louisiana is found a fauna which was appropriate to about the middle of the Pleistocene; but the elements which distinguish the early Pleistocene are missing. If they were living so late as the Recent epoch in Florida their absence in Louisiana is astonishing. The answer to these problems is that the extinct animals so often mentioned did not live on up to the Recent epoch.

For the sudden wiping out of a great assemblage of such strange beasts as existed in Florida during the Pleistocene, the rapid deposit of sand and vegetable debris mingled with trunks of trees and the bones of animals and of men, and that at as late a period as 4000 years ago, the writer can think of no adequate agency except the Noachian deluge. According to the marginal readings of the authorized version of our Bible this event occurred 2349 years before Christ; that is, 4266 years ago. Archbishop Usher, a very learned man, was perhaps tainted a little by advanced ideas and was somewhat too liberal in his dispensing of time.

4. It appears to be possible at this point to answer the question asked on page 7: What is the geologic age of stratum no. 2? In view of the fact that about 70 per cent. of the mammals found in that stratum are extinct, and that these include species which belong with the fauna of the Sheridan and Aftonian beds and are not known to have existed at a later time, the stratum is regarded as belonging to the first third of the Pleistocene.

5. What is the geologic age of stratum no. 3 at Vero? In this stratum, known as the muck-bed, there is a lower percentage of extinct mammals, about 50 per cent. This appears to indicate a somewhat later time, about the middle of the Pleistocene. This lower percentage may, however, be due partly to what one may call accidental causes. The geologists regard the interval between the two deposits as having been brief.

Dr. Hrdlička<sup>1</sup> argued that a state of culture as advanced as that shown by the artifacts found in the deposits at Vero implies a numerous and widespread population and that such a population would surely have left many tangible traces of its presence on the continent, some of which at least would have been discovered by this time. Dr. MacCurdy<sup>2</sup> has expressed practically the same opinion.

The present writer is wholly willing to say that the conclusions reached by these distinguished anthropologists are very reasonable; furthermore, that the requirement which they make need not go entirely unsatisfied. The following cases are contributed; but they have long been accessible to everybody, and it is needless to say that our good friends the anthropologists have set up over most of them the danger signal. Let us set out from the Atlantic coast.

1. In the *Proceedings of the Academy of Natural Sciences* for 1859 (pages 178-179) Prof. F. S. Holmes gave an account of the exhumation of some bones, teeth and a nearly entire tusk of a mastodon near Charleston, South Carolina. These remains were found in sands underlying peat in draining a large swamp and at a depth of about 3 feet from the surface. Professor Holmes, with a small party of gentlemen, was present during the exhumation, and Holmes found immediately alongside of the tusk a fragment of pottery. This was said to be similar to that manufactured at the present time by the American Indians. Holmes stated that bones of a deer and two teeth of a horse were also found.

Naturally, somebody will say that this potsherd had reached its position by some accidental means. It might appear that a

<sup>1</sup> *Symposium*, p. 50.

<sup>2</sup> *American Anthropologist*, vol. 19, p. 261.



burrowing muskrat had been responsible; but, although muskrats were in that region in Pleistocene times, no muskrats have in Recent times been found anywhere near Charleston. The simplest and most probable explanation is that the pottery was dropped near that tusk about the time that the animal died. The presence of the horse teeth mark the time as being not later than about the middle of the Pleistocene. In similar deposits about Charleston have been found remains of tapirs, peccaries, mylodon, megatherium, elephants (among them *Elephas imperator*), hipparion, extinct capybaras, and probably camel. These indicate early Pleistocene age.

2. The discovery of human remains and artifacts at Vero naturally takes its place here.

3. In 1846<sup>1</sup> Dr. M. W. Dickeson exhibited before the Philadelphia Academy a large series of fossil bones which had been obtained by him at Natchez, Mississippi. Among these were the head of a megalonyx and parts of the skeleton of others, besides remains of a bison, an extinct bear, a horse, and apparently a mylodon. These had been found in a blue clay which underlies the loess of that region. Lyell, who afterwards visited the ravine in which the remains were found, stated that it was 60 feet deep. Dickeson, at the meeting referred to, exhibited also a part of a human innominate bone which he said had been taken out of the same blue clay, at a depth of 2 feet below the skeleton of the megalonyx. Naturally, efforts have been made to escape the conclusion that the human bone was as old as its apparent geological situation and its association with the extinct animals implied. Lyell thought that the innominatum had possibly fallen down the cliff from some Indian graves at its summit. Others have suggested that it had been washed down to that spot from some place farther up the ravine. The bone is yet preserved in the collection of the Philadelphia Academy; and it has been described and figured by Leidy.<sup>2</sup> He stated that it did not differ in any way in appearance and manner of fossilization from the megalonyx bones with which it was found.

<sup>1</sup> *Proceedings of Academy of Natural Sciences*, vol. III, p. 106.

<sup>2</sup> *Transactions of Wagner Institute*, vol. II, pp. 9-12, pl. II.

In 1892 Dr. Thomas Wilson<sup>1</sup> had his attention attracted to this human bone and proceeded to have a chemical analysis made of it and of a mylodon bone which had been left by Dickeson. Wilson stated that the color, texture, and general appearance of the mylodon bone had a remarkable similarity to that of the human bone. The analyses were furnished by Prof. F. W. Clark, of the U. S. Geological Survey, and they resulted in showing that the human bone had a content of over 22 per cent. of silica, while the mylodon bone had not quite 4 per cent. It would be interesting in this connection to have Indian bones from the summit of that cliff chemically analyzed.

A considerable number of species of extinct animals have been reported from the loess and deposits below it at Natchez, many of them apparently from the ravine mentioned above. In the opinion of the writer they indicate a middle Pleistocene period.

4. In 1866, Mr. J. F. Clew, of Petite Anse, Louisiana, called on Doctor Leidy and exhibited a piece of coarse matting which he affirmed had been found at Petite Anse, lying on the top of a newly discovered bed of rock salt, at a depth of about 16 feet from the surface, and immediately below some elephant bones. Clew further stated that there were in view other pieces of matting and other bones for anyone to see who would visit the place. Leidy tried to have the Philadelphia Academy send a competent man down there, but nothing was done in the matter.

Prof. Joseph Henry read a paper on the subject before the Chicago Academy of Science.<sup>2</sup> Nobody has ever questioned Clews's good faith in the affair. In 1890<sup>3</sup> J. F. Joor examined an extensive excavation which was being made to reach the rock salt. He found great quantities of pottery in a swamp muck, which had a thickness of 10 to 12 feet; but the pottery appears to have been in hollows which reached down from 3 feet to 6 feet from the surface. He concluded that Indians had been accustomed to boil down the brine which formed a spring there. He found a single piece of cane basket in a lump of mud, and he thought that it came

<sup>1</sup> *American Naturalist*, vol. xxvi, pp. 628-631.

<sup>2</sup> *Transactions of Chicago Academy of Sciences*, vol. i, p. 233.

<sup>3</sup> *American Naturalist*, vol. xxix (1895), pp. 394-398.

from the lower part of the muck, or loam, below the level of most of the other human vestiges.

Below the loam was found a blue clay 2 feet or more thick. In this at a depth of from 16 to 20 feet from the surface, Joor found great quantities of bones of animals. These were afterwards studied by Professor Cope.<sup>1</sup> It appears from his communication and other reports that the following animals have been found at this place: *Megalonyx jeffersonii*, *Myiodon harlani*, *Equus complicatus*, *Odocoileus virginianus*, *Bison* sp., *Mammot americanum* and *Elephas columbi*. There are here no species which compel us to refer the deposit to the early Pleistocene. *Myiodon harlani* and *Equus complicatus* forbid the reference to late Pleistocene.

It has been suggested that Indians of recent times had sunken a shaft to the rock salt. Of this there is no evidence; it is improbable; and, if true, it is improbable that the tradition of it would have been lost. It has been thought, too, that such things as the matting, the pottery, and the animal bones had been washed down from the surrounding hills within rather recent times and covered up in the valley; but, while the bones are often broken and sometimes partly decayed, they do not show the effects of transporation. An explanation that appears to meet the requirements of the case is that about the middle of the Pleistocene, the valley was cut down so as to expose the rock salt; that men, probably Indians, carried away salt in cane baskets; that, later, through some slight change in level, material began to be deposited in the valley; and that, while this was going on, the mylodons and other animals lived and died and left their bones there.

5. It does not seem to the writer that the account given by McAdams<sup>2</sup> of the finding of a stone ax in Walkerville township, Greene county, Illinois, ought to be treated as suggesting a conspiracy of liars. Taken by itself the reported discovery would naturally have little weight; but if cases of the kind were common, no hesitation would be shown in accepting it. Dr. Shimek's objection<sup>3</sup> that there is no loess in that region which has a depth of 70

<sup>1</sup> *Proceedings of American Philosophical Society*, vol. xxxiv, pp. 458-461.

<sup>2</sup> *Proceedings of American Association for Advancement of Science*, vol. xxix, p. 720.

<sup>3</sup> *Op. cit.*

feet is not decisive. Worthen<sup>1</sup> states that the loess on that county may be from 40 to 60 feet thick. Possibly McAdams was not an expert in identifying loess; and there are often differences of opinion among the experts. It is also possible that the well had penetrated the Illinoian drift and reached a still older deposit.

6. In the *Records of the Past*, vol. II, 1903, pp. 26-28, Cyrus A. Peterson, M.D., gave an account of the discovery of a stone ax in September, 1902, near Clayton, a village just west of St. Louis and nine miles west of the Mississippi river. This region is covered with a deposit of loess which at the place named has a thickness of from 10 to 15 feet.<sup>2</sup> During the construction of the belt line of railway around the city of St. Louis a member of the engineering corps picked up the ax in question after it had been turned up by the plow of the graders. The man in charge of the work removed the clay which enclosed the ax, and this was taken to his office and scrubbed clean. It then passed into the possession of the chief engineer. The ax was found at the juncture of the loess with the substratum of red clay, and at a depth of 14 feet from the surface. It appears not to differ from Indian axes of recent times. There appears to be no reason whatever for questioning the authenticity of the discovery.

7. In 1891 Prof. F. M. Witter, of the public schools of Muscatine, Iowa, read a paper<sup>3</sup> in which he told of the finding of arrow points in the loess at Muscatine, Iowa. In one case a brickmaker reported that he had taken a chert point from the loess at a depth of 12 feet from the surface. At another time the same man took an arrow point from the same bank at a depth of 25 feet from the surface. Dr. B. Shimek<sup>4</sup> in speaking of this case refers to it as "Witter's cautious references to the discovery, by another party, of arrow-heads under extremely doubtful circumstances." As a matter of fact Witter investigated the matter as well as probably any one could and he expressed no doubt as to the authenticity of the discoveries. There was a third arrow point taken by the same

<sup>1</sup> *Geological Survey, Illinois*, vol. III, p. 123.

<sup>2</sup> Fenneman, *U. S. Geological Survey, Bulletin* 438, p. 33.

<sup>3</sup> *Proceedings of Iowa Academy of Sciences*, vol. I (1892), pt. 2, p. 66.

<sup>4</sup> *Bulletin of Geological Society of America*, vol. XIX, p. 244.

brickmaker from another brickyard in which there was a blue clay whose upper surface was 8 feet from the top of the ground. This arrow point had passed through the mixing bed before it was discovered. Witter examined the bank and inquired into the circumstances and wrote "I believe with Mr. Freeman, that the arrow point must have come from the blue clay." There is no intimation whatever that he doubted the word of the brickmaker in respect to any of the discoveries. The loess has been regarded as a deposit of the Sangamon stage; but, inasmuch as an extinct reindeer, *Rangifer muscatinensis*, has been found it, a cold climate is indicated. One might not be far out of the way to assign the time to the Iowan glacial stage.<sup>1</sup>

In the publication of 1892 above referred to, Witter reported other artifacts found near Muscatine. About a mile above its mouth, Mad Creek had cut away a point of a hill, leaving a bluff almost perpendicular and about 40 feet high. The top was covered by loess. About 10 feet from the summit was a bed of gravel one foot thick, from which a student had taken a considerable part of a tooth of an elephant. Witter examined this bed and in doing so found in it numerous flint chips such, he adds, as are supposed to have been struck from arrow and spear points, knives, etc.

8. In his report on the geology of Pottawatamie county, Iowa, Dr. J. A. Udden<sup>2</sup> reported the alleged discovery of a stone ax in the loess at Council Bluffs. It was met with in tunneling for the cellars of a brewery, under 30 feet of loess and at a distance of 40 feet from the mouth of the tunnel. Udden stated that the ax had on one side an adhering incrustation of calcareous matter that had evidently been deposited by ground water. The ax had been discovered by workmen and immediately turned over to the engineer who had charge of the operations. It is hard to see here any motive for deception on the part of anybody. Udden found no evidences of disturbance of the loess at the place.

9. In 1876 Dr. Samuel Aughey<sup>3</sup> wrote that he had found, three miles east of Sioux City, Iowa, a small arrowhead in the loess;

<sup>1</sup> Udden, *Iowa Geological Survey*, vol. ix, p. 360.

<sup>2</sup> *Iowa Geological Survey*, vol. xi, p. 261.

<sup>3</sup> *Annual Report, U. S. Geological Survey of the Territories* (1874), p. 254.

but he did not furnish any details. He stated further that he had found, two and a half miles southeast of Omaha, in a railroad cut, at a depth of 20 feet in the loess, and at a distance of at least 6 inches from the edge of the cut, a large coarse arrow or spearhead. It is fair to say that Doctor Shimek<sup>1</sup> characterizes these statements as absolutely unreliable; but the reasons are not given.

10. In 1907<sup>2</sup> Miss Luella A. Owen reported the discovery of a chipped implement in the loess near St. Joseph, Missouri. The implement is described as being composed of a fine, close-grained trap-rock. It was taken out of a perpendicular wall of the loess, along a highway, by an attorney of St. Joseph who was interested in collecting such objects. It was firmly imbedded in the loess, with the point directed nearly downward, at a height of 10 feet above the road and not less than 20 feet below the natural surface. The one side turned somewhat upward was partly coated with oxide of iron. It might, of course, be asserted that at some time in the past there had been a crevice here into which the ax had fallen. The numerous applications of this explanation tend to show that Indian implements have contracted a habit of waiting for such opportunities.

11. An interesting occurrence of flint implements in association with remains of extinct animals has been described by Prof. W. H. Holmes, of the United States National Museum.<sup>3</sup> From a sulphur spring not far from Afton, Oklahoma, Professor Holmes secured more than 800 specimens, including fragments of arrowheads, spear points, knives, etc.; and he estimated that as many more had been previously removed. This collection of beautiful flints is now in the National Museum. Nearly the whole lot was found piled together at the bottom of the spring at a depth of from 4 to 7 feet. In the same spring were found, according to Holmes' report, many teeth and bones of mammoth, mastodon, horses, buffalo, deer, elk, and wolf. The greater part of these were found within a radius of 3 feet from the spring basin, at a depth of from 4 to 7

<sup>1</sup> *Op. cit.*, p. 244.

<sup>2</sup> *Records of the Past*, vol. VI, pp. 289-292.

<sup>3</sup> *American Anthropologist* (N. S.), vol. 4 (1902), p. 108. *Report of U. S. National Museum* (1901), p. 237.

feet. Within this area were found at least 100 mastodon teeth, 20 mammoth teeth, and many teeth of horses and bison. Professor Holmes came to the conclusion that Indians who had inhabited the region had regarded the spring as sacred and had cast the flint implements and possibly many of the bones and teeth into it as offerings to the divinities of the spring. It is to be noted that the presence of all these objects indicates that the vent of the spring had not changed position for a very long time.

The present writer has had the opportunity to study the collection of bones and teeth which was made at Afton, and he finds that it includes 19 distinct species of mammals. Among these are *Castoroides ohioensis*, four species of extinct horses, two species of camels, the extinct moose *Cervalces*, the extinct muskox *Symbos cavifrons*, *Elephas columbi* and *E. imperator*. Of the latter there are several beautifully preserved teeth. Including in the estimate the common bison and two wolves, which may have got into the spring within comparatively recent times, we find that two thirds of the species are extinct. In short, we have here again the Sheridan, or Aftonian, fauna which is so often met with all over the Plains region. That these remains were cast into the spring by human hands is out of the question; for such objects are undoubtedly very rarely found on the surface in that region; and they are, according to Holmes' investigations, met with in the deposits around and at a distance from the spring. Nor does the writer believe that those bones and teeth that were found in the spring belonged necessarily to animals that died within a very few feet of the spring.

It seems perfectly evident that a stream of water rising from the earth must continually wear away the walls of the orifice, which does not need on that account to become larger. The earth near by will be pressed toward the opening and will keep its size reduced. The effects of long-continued pressure of the earth on retaining walls may easily be observed. The result will be that there will be a slow but unceasing movement of the ground and whatever is in it toward the spring. Once within the spring, the fine materials will in time be swept away, while the bones and teeth, if any, will

remain there until they are worn out or decay. If that sand deposit at Afton was laid down during the first third of the Pleistocene, it is not strange that so many bones and teeth were found in the spring itself. Professor Holmes himself, in a way, recognized the possibility of this movement of the ground.<sup>1</sup>

If we assume that the diameter of the vent was two inches and that a layer one half inch in thickness around the vent was carried away in a year, an estimate will show that in 100,000 years all the earth within a radius of about 30 feet would have been brought up to the spring and swept away.

As already said, Professor Holmes has regarded the flint implements found at Afton as the offerings of Indians to the god of the spring; and he has furnished some evidence in support of his view. It is impossible to refute this opinion; but the writer does not see why the testimony of superannuated Indians in this case should be regarded as having greater value than that of honest white men, in other cases. And there may be found some other explanation of this matter. Possibly early Pleistocene Indians, lying in wait to get meat for their families, shot arrows which missed the mark and fell into the muck. In time, like the teeth and bones, they were carried into the spring and during long ages accumulated there. They were sharpened to keen edges, perhaps not to touch the hearts of the divinities of the spring, but to pierce the tough hides of the buffaloes. Against the theory that the flints were thrown into the spring is the fact that one implement was found in the deposit of sand at a depth of 3 feet from the surface of the ground and 3 or 4 feet from the curbing which was put down in the spring. At any rate, we have here another intimate association of artifacts of human beings with remains of early Pleistocene mammals, and this may mean their contemporaneous existence.

12. In 1902<sup>2</sup> Dr. S. W. Williston reported that in 1895 Mr. T. Overton and Mr. H. T. Martin, assistants in the paleontological department of the University of Kansas, had discovered an arrow-head lying beneath the scapula of a fossil bison, in Logan county,

<sup>1</sup> *Op. cit.*, p. 242.

<sup>2</sup> *American Geologist*, vol. xxx, pp. 313-315.



Kansas. At this place the skeletons of five or six adult bisons were found within an area of about 10 feet square, besides the skeletons of two or three young ones. Overlying these skeletons was 20 feet of the so-called plains marl. Mr. Martin has informed the writer that the bank where the first of the bones was seen was perpendicular and that it was 12 feet farther in where the arrow-head was found. Dr. Williston had long known Mr. Martin, who first saw the weapon; and he had not the slightest doubt of the reliability of the testimony given by him and Mr. Overton.

Now, the fossil bisons found at that place belong to *Bison occidentalis*, a species which has left its remains at a good many localities in our country. None of these remains, however, has ever been reported from any deposit which overlies Wisconsin drift. The skeletons found in Logan county may therefore be as old as the Aftonian or may belong to any succeeding pre-Wisconsin stage.

13. A brief reference must be made to what is known as the Nampa image. In 1889 an artesian well was being bored at Nampa, Idaho, a town on the Oregon Short Line railroad. The well was closely tubed by a six-inch pipe. While materials were being brought up from a depth of about 320 feet, there appeared an image an inch and a half in length which represented a woman and which was made of baked clay. A brief account of this discovery is given in G. F. Wright's *Ice Age in North America*, page 701, with a figure of the object. In the *Proceedings of the Boston Society of Natural History*, volume XXIV, 1890, pages 424-450, appear the discussions of the investigations which were made on this image. The possibility of any accidental or fraudulent intrusion of the object appears to be excluded.

In arriving at the depth noted above, the drill passed through 60 feet of soil, then from 12 to 15 feet of lava rock; while below this were deposits of various kinds. Naturally our anthropologists are inclined to question the authenticity of this discovery, especially on account of the great age that it indicates for a rather advanced race of men. Wright accepts the object as genuine, but regards the deposits as rather late Pleistocene.

In the Nampa folio, no. 103 of the United States Geological Survey, a section of the well is given. Reference is made to the discovery of the image. The authors say that "further confirmation of this occurrence has not been forthcoming and the image may have been dropped into the wellhole by some one wishing to perpetrate a practical joke." This statement is to be compared with the discussion before the Boston Society as cited above.

The beds passed through in this well are referred by the authors of the folio to the Pliocene. From deposits within the quadrangle believed by them to be of the same age they reported remains of *Equus*, *Procamelus* (probably *Camelops*), *Mammut*, a mastodon which was different from *M. americanum* and which therefore probably belonged to *Gomphotherium*, besides some other apparently extinct mammals, and an extinct swan. Here we have once more the *Equus*, or Sheridan, or Aftonian fauna, and the deposits certainly belong to the Pleistocene.

14. Brief mention will be made of the supposed discovery of arrow and spearheads of obsidian at Christmas lake, Oregon, in 1877, as reported by Professor Cope.<sup>1</sup> At this place there was found an abundant fauna consisting of mammals and birds, and belonging, as Cope then held, to the Pliocene. Mingled with these remains were found numerous obsidian implements. Naturally, efforts have been made to show that these weapons were of recent origin; and Cope himself<sup>2</sup> admitted that the evidence was not absolutely conclusive. Nevertheless, the other view may well be the correct one. It appears not improbable that the bones and flints had rather recently been brought to the surface by the action of the winds.<sup>3</sup>

15. Attention may be called to an article written by Prof. J. F. Kemp, of Columbia University, in 1906,<sup>4</sup> in which he details the finding of mortars and pestles in auriferous gravels at Waldo, Josephine county, Oregon. He stated that these occurrences add

<sup>1</sup> *American Naturalist*, vol. XII, p. 125.

<sup>2</sup> *Proceedings of Academy of Natural Sciences, Philadelphia*, 1882; *American Naturalist*, vol. XXIII, p. 979.

<sup>3</sup> Gilbert, *Monograph XI*, U. S. Geological Survey, p. 394.

<sup>4</sup> *Science*, vol. XXIII, p. 435.

their contribution to the general mass of evidence regarding the antiquity of men in the far west. He also expressed his realization of the criticism which is usually brought to bear on such reports.

16. In 1880<sup>1</sup> Professor Cope reported that during the summer of 1879 he had obtained bones of *Myiodon* from the auriferous gravels of Klamath river, near Yreka, California, from excavations which he had personally examined. He secured also vessels of vesicular basalt, which, he said, had been undoubtedly procured from the same excavations. Of course, there was some chance here for the perpetration of a joke on a paleontologist, but Cope was a man not easily imposed upon.

17. We ought not to pass by the discoveries made in the caves of northern California by Dr. John C. Merriam and his students, Dr. W. J. Sinclair and Mr. E. L. Furlong. These discoveries were discussed by Doctor Merriam and Prof. F. W. Putnam in the *American Anthropologist*, volume VIII, 1901, pages 221-228; 229-235. In Potter creek cave Dr. Sinclair found 45 species of mammals, of which at least 21 were considered extinct; that is about 46 per cent. The list was presented by Sinclair in 1904.<sup>2</sup> There are in it two species of horses, apparently two of *Megalonyx*, a bison, a camel, the remarkable artiodactyl *Euceratherium*, the extinct wolf *Canis dirus*, and the extinct bear *Arctotherium simum*. The fauna is regarded by Sinclair as of the same age as that of Fossil Lake, Oregon, and that found near Hay Springs, Nebraska.

Now, associated closely with these remains were many splintered bones, some of which seemed to have been shaped and polished by human hands. Regarding these Professor Putnam remarked that it seemed impossible to explain their presence excepting by the agency of man. Dr. W. D. Matthew of the American Museum of Natural History and J. W. Gidley examined these bones and reported that in their opinion the only explanation of the perforations was that they were the work of man.

In Samwel cave was found a fauna which was regarded as somewhat younger than that of the Potter creek cave. In it were found

<sup>1</sup> *American Naturalist*, vol. XIV, p. 62.

<sup>2</sup> *University of California, Publications in American Archaeology and Ethnology*, vol. II, p. 17.

split and polished bones similar to those mentioned; besides these were secured a chipped fragment of basaltic lava and a chipped fragment of obsidian. These were, however, not seen in place.

18. Table Mountain, in Tuolumne and Calaveras counties, California, has for more than a half century been a storm-center of debate. For information and opinions the reader may consult J. D. Whitney,<sup>1</sup> G. F. Becker,<sup>2</sup> W. H. Holmes,<sup>3</sup> W. J. Sinclair<sup>4</sup> and G. F. Wright.<sup>5</sup> The contention regards the alleged discovery of remains of man and his works in the auriferous gravels, and the age of the remains. Whitney, Becker, and Wright affirm the sufficiency of the evidence; Holmes and Sinclair deny this. The two latter writers certainly have shown great skill in throwing doubt on all the finds. Fortunately, all the authors agree that Table Mountain is a reality.

Professor Holmes appears to base his objections to admitting the authenticity of the discoveries on the idea that they would prove the existence of a race of Tertiary Indians as advanced as those of today. This view is certainly incorrect. The mammals that have been mentioned in connection with the discoveries in that region are rhinoceros, elotherium, hippopotamus, mammoth, mastodon, tapir, camel, horse, bison, and deer. Certainly the first two do not belong with the others, as Cope long ago pointed out; and they are not known to have had anything to do with any human remains. As to the hippopotamus, there was some error. The existence of any animal of the kind in this country has not been confirmed. The other animals are members of the Sheridan fauna so often mentioned in this paper; and, so far as we know, it existed during the first interglacial period of the Pleistocene. If these human remains and artifacts and those animals have been found in those auriferous gravels, as the writer believes the evidence taken as a whole indicates, we do not have to accept a Tertiary man, but one of early Pleistocene times.

<sup>1</sup> *Memoirs of Museum of Comparative Zoology, Harvard University*, vol. VI (1879).

<sup>2</sup> *Bulletin of Geological Society of America*, vol. II (1891), p. 189.

<sup>3</sup> *Annual Report, Smithsonian Institution for 1899*, p. 419.

<sup>4</sup> *University of California Publications in American Archaeology and Ethnology*, vol. VII (1908), p. 107.

<sup>5</sup> *Ice Age in North America* (1911), p. 687.

It must be added that as accomplished a geologist as Clarence King extracted by his own hand a pestle out of the auriferous gravels beneath the basalt capping at Table Mountain, as is related by Becker. Sinclair's paper may be consulted for remarks on this discovery.

19. In 1889<sup>1</sup> W J McGee published a paper on his discovery of an obsidian implement in the wall of a canyon of Walker river, Nevada, at a point about fifteen miles from Lake Walker. The implement was found sticking point outwards in the old lake silt at a distance of 25 feet from the summit. McGee examined carefully the condition surrounding the object and was unable to find any reason for believing that it had been introduced after the laying-down of the silt. His discussion of the subject is commendable. In the same deposits of ancient Lake Lahontan he found bones of elephant, bison, horse, and camel. In I. C. Russell's work on Lake Lahontan<sup>2</sup> reference is made to McGee's discovery. The bones and implement were buried in the clays, which were regarded by McGee, G. K. Gilbert, and Russell as having been laid down during the waning of the later of the two glacial epochs which they recognized and as thus belonging to a time not far removed from the Recent.

On the other hand the presence of horse and camel remains must push the age of the clays back to the first third of the Pleistocene, apparently not later than the close of the Kansan glacial stage. In what are deposits of probably the same age laid down in old Lake Bonneville have been found remains assigned to *Bison latifrons*.<sup>3</sup> The remains probably belonged to another species of *Bison*, but they indicate an age at least pre-Wisconsin.

It seems apropos to cite here another testimonial to the fact that man lived in the New World during early Pleistocene times. Some years ago, in a dry cave in southernmost Patagonia, there were found a part of a skin and many bones of the great ground-sloth *Grypotherium*, related to *Mylodon*. There were found evidences that men had occupied the same cave and had possibly

<sup>1</sup> *American Anthropologist* (N. S.), vol. 2, pp. 301-312.

<sup>2</sup> *Monograph XI, U. S. Geological Survey*, pp. 247-269.

<sup>3</sup> King, *U. S. Geological Exploration of the 40th Parallel*, vol. 1, p. 494.

domesticated the sloth. Associated with these remains of the sloth and of man were those of various extinct Pleistocene animals. Dr. A. S. Woodward concluded a paper<sup>1</sup> by saying that zoologists and geologists could not fail to agree that the ground sloth belonged to the Pampean fauna, and that they could hardly refuse to believe that the animal was actually kept and fed by an early race of man. The Pampean fauna belongs to the Pleistocene.

It seems to the writer that the cases above cited testify strongly to the fact that during early and middle Pleistocene times there existed in North America a population which was spread from the Atlantic Ocean to the Pacific; and that it left many tangible traces of its presence.

When Thomas Wilson, as above cited, called attention to the significance of the high degree of mineralization of the human bone found at Natchez, he made the judicious remark that one swallow does not make a summer. It may not be wrong to suggest, however, that when they come in flocks one has a right to conclude that at least the vernal season is on.

Doubtless in almost every case of discovery of an object buried in the earth some weak point can be found in the evidence; for the conditions are always complex. Most discoveries are made accidentally and by men who do not know the significance of the objects, nor what observations to make and record. One might wish that such men could have a presentiment of the discovery that was looming and could have at hand a geologist or a physical anthropologist to witness its advent; but it appears that expert geologists receive little more consideration than expert well-diggers. It seems to the writer that our friends the anthropologists give too little weight to the cumulative effects of the reported discoveries of Pleistocene man. That juror would render a bad verdict who would direct his attention to the weak points of the testimony of a lot of witnesses, to their stupidities, evasions and contradictions, and not regard the consistent story which ran through the testimony of all.

Among the most familiar objections offered against the authen-

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<sup>1</sup> *Proceedings of Zoological Society of London* (1900), p. 78.

ticity of reported discoveries of early man are these: There was no scientific expert present; there were no witnesses to corroborate the statements of the finder; the object may have fallen down from some later deposit to the spot where picked up; it and the accompanying fossil bones may have been washed down quite recently from some older deposit; it may have worked its way down through a crevice or through some animal's burrow or by a hole left by a decayed root; some seeker after notoriety or an unscrupulous collector may have tried to impose on the public; or the ubiquitous joker may have exercised his wits on an unsophisticated geologist or anthropologist. Certainly all these are possible geological agencies and must be taken into account; but to what extent do they operate?

What is to be said about the geographical and stratigraphical distribution of alleged discoveries of early man in this country? A great sweep of territory extending from the Atlantic to the Pacific, including large portions of our most densely inhabited states is covered over with drift deposits belonging to four or five glacial stages. Into this drift materials there have been sunken innumerable cellars and dug wells, many shafts to reach coal and to prepare foundations for bridges and large buildings. In numbers unreckoned there have been wells bored to reach water and gas and petroleum. Railways have been cut through thousands of hills composed of glacial till. Along nearly every river and brook within the glaciated region are found banks, often many feet high, which offer fine sections of one or the other of the different glacial sheets. In this region gravity acts as elsewhere and so does the transporting power of water. The drift may be about as liable to crack and slump as is the loess. In this region the trees may or may not send down as deep their roots as in the loess of Missouri or the muck beds of Florida, but they do penetrate the drift. The gophers, prairie dogs, woodchucks, and badgers living on the drift are doubtless just as industrious as elsewhere. It is not to be doubted that every man who knows anything about geology, or paleontology, or has any inkling of anthropological questions has scanned eagerly the sections of the drift along our railroads and

our streams in the hope of finding there some relic of former man. Now, how many discoveries of such relics have been reported as having been made in the undisturbed drift of the ground moraines and terminal moraines? With perhaps a single exception, the writer has been able to learn of none. The literature of the subject has been pretty well examined; and application to eminent glaciologists has been made and no cases have been discovered. The exception made is the discovery reported by G. F. Wright;<sup>1</sup> but here too the find was in gravel along a river, and this gravel was possibly reworked glacial materials. Even in a terminal moraine, where the glacial ice alternately advanced and receded, there might be found relics of some hardy race which lived close to the ice front; but men could not have lived under the glacier. It is for our friends the anthropologists to reflect why discoveries of human remains and artifacts are not reported from unmodified drift deposits. Why do the geological agencies which have been invoked so often in other regions not act also in the glacial till? It looks as if their value was reduced to almost negligible quantities. And one might further inquire whether, when they live and move on glacial drift, rascally collectors become more honest or more circumspect; jokers less facetious; and geologists and anthropologists less credulous?

Over large portions of our country south of the glaciated region there is spread out a mantle of materials which have resulted from the weathering of deposits of various ages. These constitute the greater part of Dr. W J McGee's Lafayette formation. They consist of gravels, sands, and clays and cover an area of more than 200,000 square miles; and they extend from near the coasts of the Atlantic Ocean and the Gulf of Mexico to elevations of from 500 to 1500 feet. The areas occupied by these deposits were formerly well populated by Indians; and the materials appear to be well adapted to receive artifacts through the accidental agencies which have been mentioned above. Moreover, in many places the materials have been considerably eroded, so that such inclusions might be brought to view. The writer has not been able to learn

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<sup>1</sup> *Ice Age in North America*, pp. 651-653.



that any one has ever set up a claim to have discovered in this so-called Lafayette any traces of early man.

It appears to the writer that the matter may be summed up thus: In Pleistocene deposits laid down under conditions which permitted the existence of man we find numerous evidences of his presence. In Pleistocene deposits originating under conditions forbidding the presence of man and in older accumulations no traces of man's existence are met with, even though both those of Pleistocene age and the older ones are adapted to receive adventitious inclusions of artifacts.

The opposition that is presented against the idea that a race like our present Indians lived in our country during Pleistocene times is based on the views that European anthropology furnishes us a scale by means of which may be measured the time and the manner of development of the human race over the whole world. Now, it is not at all probable either that the human race had its origin in Europe or that the rest of the world received its populations from Europe. It is far more probable that man appeared first in Asia; perhaps, as Arldt<sup>1</sup> suggests, on the Thibetan plateau. From this center, the races streamed forth in all directions, somewhat as is shown on Arldt's plate 23. It is improbable that the Heidelberg and Neanderthal men had anything to do with the present human races, except in having had, somewhere back in the Tertiary, an origin in common. They represented species of beings different from *Homo sapiens*, species that attained a certain stage of bodily and mental development and then were exterminated by the superior races. If they too were of Asiatic origin, they were swept westward by the advancing waves of more intelligent tribes until reaching Europe they for a time held their pursuers at bay. Meanwhile the superior races were probably populating the other continents and the islands of the sea; and this occupation probably went on during late Pliocene and early Pleistocene times. We cannot avoid the conclusion that about the close of the Pliocene and probably at different times during the Pleistocene there was free communication between the lands of northeastern Asia and northwestern

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<sup>1</sup> *Die Entwicklung der Kontinente*, p. 606.

America. Over the wide land-bridge existing there the animals of Asia swarmed into America and American animals into Asia. If man existed in Asia at that time, there appears to be no reason why he should not have accompanied on this journey the beasts with which he had associated.

It is to be noted at this point that there is by no means agreement in Europe among the anthropologists on the one hand and geologists on the other, regarding the time when the first men-like creatures reached Europe and regarding the glacial and the interglacial stages during which the various primitive races flourished in that country. The early cultures which by the anthropologists are put in the third interglacial are relegated by Penck, Geikie, and Wiegiers to the second interglacial stage; and by Wiegiers the pre-Chellean is put back into the first interglacial.

We have now to inquire whether or not a race of men with about the grade of development of our North American Indians would have been out of harmony with the rest of the mammalian fauna during the first interglacial stage in North America, that known as the Aftonian. The writer believes that the ancestor of the present races who should have existed during the first third of the Pleistocene in a stage represented by the Heidelberg man would have been an anomaly. It seems evident that not another land mammal belonging to the Quaternary epoch of North America or Europe has undergone anything like the profound changes which man would need to have undergone in order to make such ancestry possible.

At the outset, the collections which have been made in early Pleistocene deposits at various places in North America show from 20 to 50 per cent. or more of species which still exist, and which have undergone no changes that are perceptible. Among these may be mentioned the Virginia deer, the beaver, the brown bear, the raccoon, the glutton, the gray wolf, the coyote and the gray fox. Possibly with more complete materials some of these might be separated specifically. Other species are with difficulty distinguishable, or not at all, from existing ones, as one of the fossil tapirs. Many others are certainly specifically different, but the differences

are not great. There are several species of early Pleistocene horses; but when one has the skull and even the skeleton of one of these the characters distinguishing it from the existing horses are often not easy to discover; and one must often fear that he may have had palmed off on him the remains of the domestic horse. As regards the development of the brain, that of a horse from the Sheridan beds is as large as that of the domestic horse or even larger. The early Pleistocene bisons resembled greatly our existing bison, but had longer horns. The extinct tapirs of the early Pleistocene differed little from those now living; and the same is true of various feline and canine forms. The giant beaver, *Castoroides ohioensis*, appears to have lived from the beginning to the end of the Pleistocene. Just why it did not continue on to our day is not known. The same remark is true of the American mastodon, of *Elephas columbi*, and *E. primigenius*. Similar observations may be made regarding the stage of development of the early Pleistocene animals of Europe. Why should it be supposed that our ancestors were so retarded in their evolution until past the middle of the Pleistocene and that this evolution then should have suddenly been quickened? The various divisions of the Pleistocene differ from one another and from the Recent epoch principally in the successive extinction of animals, especially of the large and striking species; and not so much in changes in structure. Taking into consideration the rather unimportant morphological advancement made by the great majority of vertebrates since the early Pleistocene and the extinction of so many highly differentiated forms one might be pardoned for entertaining the view that on the whole the vertebrates have lost ground.

It may be permitted now to inquire whether the nearest relatives of man, the higher apes, have undergone important structural changes since the geological epoch when they first present themselves to us. In the Siwalik deposits of northern India, which belong to the latter part of the Miocene or early Pliocene, there has been found a palate of an ape which Lydekker referred to the genus *Troglodytes* (now *Pan*), the type of which is the existing chimpanzee. Lydekker stated that the teeth differed from those of the chim-

panzee in presenting a still more marked approach to the human type of dentition. In the same deposits was found a canine tooth of an ape which resembled so closely the corresponding tooth of the orang-utan that it was impossible to distinguish the two. There existed a species of *Semnopithecus* whose molars were extremely like those of the existing proboscis monkey. Two species of *Cynocephalus* were discovered, with regard to which Lydekker remarked that it could not be certainly affirmed that they were distinct from yet existing species of baboon. If these animals had at that early time reached such a high grade of development and if this has been maintained without important change to our day, why should it be thought a thing incredible that a race of men had attained in the first third of the Pleistocene the native American level and that it has not departed greatly from it up to the present?

The anthropologists who have discussed the discoveries made at Vero have impressed us with the fact that the human bones and the implements are identical with those of rather recent Florida Indians. They are the men to decide this question and the rest of us must submit. However, Dr. MacCurdy in his last article on the subject, indicates that this is not the whole of the matter. The bone points, he tells us, may be duplicated from southern and far southwestern mounds. The bone fish-hooks are exactly such as have been found in Connecticut. The same, he says, is true regarding the pottery. Might he not also have extended the range of similar objects both in space and time, in space to considerable parts of the Old World and in time well back into the Pleistocene of Europe? Is it not true likewise that, while the human bones resemble those of recent Florida Indians, they resemble also those of most other Indians? Under the circumstances, it does not appear to be necessary to conclude that these bones and artifacts were derived from Florida Indians living within 4000 years.

If the reader will consult a paper written by H. Klaatsch<sup>1</sup> he will find that in Tasmania and Australia the majority of the artifacts were similar to those of Mousterian times in Europe. In Australia were found chipped implements which were quite like

<sup>1</sup> *Zeitschrift für Ethnologie*, vol. 40 (1908), pp. 407-428.

those referred in Europe to the Chellean and Acheulean; others were even more primitive than the supposed eoliths of the Miocene and Oligocene. It is evident, therefore, that some races of men stand still in their culture or move so slowly that their progress is imperceptible.

Finally, Dr. MacCurdy offers as evidence against the great age of the pottery found at Vero the fact that not even the rudest pottery is found in the argillite culture in the Delaware valley. This argument loses its force when it is considered that even within historical times many Indian tribes have had no knowledge of pottery.

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